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CHAPTER 11 MAINTENANCE OPERATIONS

11.1 CHAPTER GOALS

The goals of this chapter include the following:

- Describe how ADOT maintenance activities may be best integrated with BLM/FS resource management concerns.
- Describe the Annual Highway Maintenance Partnering Meeting, which will serve to initiate and facilitate effective communication between ADOT maintenance districts and their associated BLM field offices and/or FS districts.
- Outline opportunities for ADOT maintenance personnel to provide input during the design of proposed highway corridors.
- Outline routine ADOT maintenance activities and appropriate strategies for accomplishing those activities.

As defined in this chapter and for the purposes of ADOT maintenance, “existing alignment” refers to the roadway pavement, structures as well as the Recovery Area (or Clear Zone) as approved at the time of construction and as noted on project records.

11.2 MAINTENANCE, PLANNING AND DESIGN

Personnel that will be involved in the maintenance operations and management of new and reconstructed roadways and facilities should be offered the opportunity to review and comment on the proposed design. At a minimum this review should include the ADOT Maintenance Supervisor from the local district, the ADOT Natural Resources Management Section Regional Manager and the local BLM office or Forest District Ranger and Forest Engineer. Written comments regarding the interim plan submittals (Scoping and Stages I, II, III, IV, V) should be submitted to the ADOT Project Manager for transmittal to the designers.

11.3 MAINTENANCE OPERATIONS ON BLM/FOREST SERVICE LANDS

Annual Highway Maintenance Partnering Meeting

Each ADOT District prepares an Annual Work Plan that describes anticipated maintenance activities within that district. Prior to finalizing the Plan, the ADOT District should forward the following information to BLM Field Office(s) or FS District(s) located within that ADOT District:

- Cover letter to BLM Field Office Manager and/or FS District Ranger identifying purpose of correspondence and indicating information that the ADOT District desires from the BLM Field Office/FS District (e.g., Threatened and Endangered Species, archeological sites, types of required environmental reviews, etc.).
- Map of ADOT-maintained roads and facilities (such as rest areas, maintenance yards and material sources) that are located within lands managed by BLM/FS. This map should be colored by public agency jurisdiction.
- Descriptions, locations and approximate schedules of proposed routine ADOT maintenance activities on those roads and facilities.
- Descriptions of unplanned/emergency type activities.
- Listing of all non-routine ADOT projects (new construction, Federal-Aid projects, etc.)

This information will be the basis for the Annual Highway Maintenance Partnering Meeting to be held between ADOT and BLM/FS. The meeting will offer personnel from these agencies an opportunity to re-establish working relationships and to review, amend, approve and/or reject proposed maintenance activities. At a minimum, the ADOT District Engineer, ADOT District Maintenance Engineer, ADOT Maintenance Supervisor, ADOT Maintenance Superintendent, ADOT Natural Resources Regional representative, BLM Field Office Manager/FS District Ranger and BLM/FS Engineer should attend this meeting. The agenda for this meeting should typically be as follows:

- General review of maintenance activities (routine, non-routine, and unplanned/ emergency).
- Review and exchange of sensitive information such as Threatened and Endangered species, archeological sites and noxious or invasive species, etc. This item should include locations and any recommended protection measures.
- Discussion of environmental documentation required for maintenance activities and identification of associated agency

responsibilities. Schedule of actions and deliverables should be agreed upon.
- Meeting administration:
  - Identification or update of agency contact information;
  - Listing of agreed upon items (compliance) and action items (planning);
  - Scheduling of next years meeting and any necessary additional sessions.

Minutes from this meeting should be taken and later distributed by the ADOT district.

Environmental Compliance and Documentation for Maintenance Operations

Each federal public agency approaches the NEPA process and compliance with other resource laws in different ways. For highway projects, generally the funding source used to design, construct or maintain the highway corridor will dictate which agency has responsibility for complying with NEPA and/or other resource laws when applicable. However, the type of a given maintenance activity may also dictate whether a NEPA decision is required and/or which agency is responsible for administration and compliance with other resource laws. The responsible agency will, in turn, determine the standards for addressing these requirements.

For projects on FS lands, maintenance operation activities of an existing alignment (see below) **do not require NEPA documentation**. However, these activities are not excluded from complying with other laws and regulations such as the Native American Graves Protection and Repatriation Act, the Archeological Resources Protection Act and the Endangered Species Act. These maintenance operation activities include but are not limited to:
- Emergency repairs.
- Restoration of surfacing, shoulders, roadsides.
- Restoration or replacement of all structures (including bridges).
- Cleaning ditches and cross-drainages
- Minor (less than 100 feet in length) slope flattening for erosion mitigation, snow removal, sight distance or other safety reasons.
- Controlling brush and roadside vegetation to maintain recovery zones, sight distance and to remove hazard trees.
- Slope stabilization & scaling.
- Removal of hazards & other obstructions.
- Preserving and adding traffic control measures to conform with the Manual on Uniform Traffic Control Devices (MUTCD), etc.

Rehabilitation and reconstruction activities on FS lands **do require an additional NEPA decision**. These activities include but are not limited to:
- Minor realignment (i.e., straightening excessive curves).
- Minor widening (adding lane and/or shoulder width); adding auxiliary lanes (passing, turning, climbing, parking, etc.).
- Major (more than 100 feet in length) slope flattening for erosion mitigation, snow removal, sight distance or other safety reasons; etc.

Maintenance activities that require NEPA clearance and that do not utilize federal funding will be discussed at the Annual Highway Maintenance Partnering Meeting (see above) in order to determine which agency will be responsible for administering these requirements. In general, BLM or FS will act as the lead federal agency. ADOT's role will typically be that of an applicant or designee and therefore it will address NEPA requirements in accordance with BLM or FS standards.

Maintenance activities that utilize federal funding will require NEPA clearance and will coordinate with FHWA as the lead federal agency.

11.4 ADOT MAINTENANCE OPERATION ACTIVITIES

ADOT maintenance operations should minimize impacts to natural and cultural resources using standard work methods identified in the Performance Control System (PeCoS), Best Management Practices (BMP's), and BLM/FS sensitive resources information and protection measures agreed to at the Annual Highway Maintenance Partnering Meeting. In all cases, ADOT maintenance operations should minimize impacts to natural drainages and associated environments as required by the NPDES and AZPDES. ADOT should avoid or minimize disturbing soils that will erode into drainages, even those ditches and slopes that are not directly adjacent to streams. Where soils are disturbed, ADOT maintenance personnel should employ BMP's as described in the ADOT Maintenance and Facilities Best Management Practices Manual.

Typical operation activities include the following:

Equipment Parking
All maintenance equipment should be stored or parked overnight in approved locations. During routine daily operations, vehicles may be parked for short periods at developed pullouts, Figure 11.1, parking areas and other locations specifically agreed upon at the Annual Highway Maintenance Partnering Meeting.

Figure 11.1 Maintenance equipment may be parked for short periods at developed pullouts.

Waste Disposal
For routine maintenance and minor construction projects undertaken with maintenance personnel, storage, staging and waste disposal areas should be identified in the project plans or documentation, for review by BLM/FS. Materials should not be sidecast indiscriminately on shoulders, embankments, in drainageways or at retaining wall locations. Existing storage yards and waste disposal areas should be utilized to the fullest extent possible.

Storage and Staging Areas
Areas designated for waste/ excess material disposal should be identified during the Annual Highway Maintenance Partnering Meeting. Waste materials should not be sidecast indiscriminately over shoulders, embankments, in drainageways or at retaining wall locations. Existing storage yards and waste disposal areas should be utilized to the fullest extent possible.

Joint use of BLM/FS maintenance yards for temporary storage (to expedite efficient moving, storage and/or distribution of materials) should be investigated and reviewed during the Annual Highway Maintenance Partnering Meeting. The potential for reuse and/or placement of waste materials by the BLM/FS should also be investigated.

Material Sites
Refer to Chapter 9

Vegetation Management Activities
ADOT is responsible for providing the motoring public with safe and aesthetically pleasing highway corridors. Accordingly, ADOT uses a variety of vegetation management techniques--mechanical, chemical, manual and cultural--in an intergraded approach to control vegetation along Arizona highways.

Each BLM/FS local office should clearly state local policy regarding the removal of vegetation in the ADOT easement; this information will be discussed at the Annual Partnering Meeting. The policy should address opportunities and requirements for salvage timber sales and timber cruising timelines associated with removal of trees.

Noxious and Invasive Species
Noxious and invasive weed species, Figure 11.2, pose significant threats to both natural and human environments and highway corridors can act as conduits for the spread of these undesirable species (see Chapter 7). Highway maintenance activities should be coordinated to minimize the colonization and establishment of these species. Measures that can minimize the spread of weeds in highway corridors include:

- Learn to recognize noxious and invasive weed species (see end of this chapter for links to websites listing state and federal noxious weeds). At the annual maintenance partnering meeting, agree to strategies for reporting locations of and treating weeds.

Figure 11.2 Tribulus terrestris (Goatheads), on the list of Arizona Noxious and Invasive Species.

- Before ground-disturbing maintenance activities begin, inventory and prioritize weed infestations for treatment in project operation areas and along access routes. Control weeds as necessary, as early as possible in the project planning process.
- Locate and use weed-free project staging areas.
- Clean equipment transported from outside of the BLM/FS district prior to entering the local district. If necessary and in consultation with BLM/FS, identify site(s) where equipment can be cleaned. All mud and plant debris should be removed and contained as directed in the ADOT *Erosion and Pollution Control Manual*. This practice does not apply to service vehicles traveling frequently in and out of the project area that will remain on the roadway.
- Do not blade or pull roadsides and ditches that are infested with noxious weeds unless doing so is required for public safety or protection of the roadway. If the ditch must be pulled, wherever possible, eradicate weeds prior to maintenance activities. If eradication is not feasible, ensure that the weeds remain on-site. Blade from least infested to most infested areas. When it is necessary to blade noxious weed-infested roadsides or ditches, schedule activity when seeds or propagules are least likely to be viable and to be spread. Minimize soil surface disturbance and contain bladed material on the infested site.
- Avoid acquiring water for dust abatement where access to the water is through weed-infested sites.
- If operating in areas infested with weeds, clean all equipment before leaving the project site as described above.
- Maintenance personnel need to inspect, remove, and properly dispose of weed seed and plant parts found on their clothing and equipment. Proper disposal means bagging the seeds and plant parts and incinerating them.
- Inspect material sources on site, and ensure that they are weed-free before use and transport. Treat weed-infested sources for eradication: strip and stockpile contaminated material for proper disposal. Inspect and document the area where material from treated weed-infested sources is used, annually for at least three years after project completion, to ensure that any weeds transported to the site are promptly detected and controlled.
- Maintain stockpiled material in a weed-free condition.
- In heavily forested environments, retain shade to the extent possible to suppress weeds and prevent their establishment and growth.
- Where maintenance activities disturb soil, salvage (weed-free) topsoil and seed disturbed areas with native vegetation species in order to minimize opportunities for weed establishment (see Chapter 7).
- Where soils are disturbed in weed-infested areas, document and inspect these areas for at least three growing seasons and provide follow-up maintenance as required.

Selective Tree Removal

Maintenance crews routinely remove hazardous vegetation within the rights-of-way. Therefore, these activities should be discussed at the annual partnering meeting, including appropriate means by which trees will be removed (e.g. felling, cutting, chipping, debris disposal, etc.) Figure 11.3, and any necessary mitigation.

Figure 11.3 Selective tree removal needs to be discussed at the annual partnering meeting.

Hazardous (Unsound) Vegetation

Hazardous trees and brush within transportation corridors may be removed for safety purposes, including recovery areas (clear zones) and other areas within the rights-of-way. AASHTO guidelines on hazardous obstructions and recovery areas are followed.

Unsound trees within the rights-of-way should be jointly identified by ADOT and BLM/FS. However, timely removal of unsound trees is both necessary

Figure 11.4 Shading on pavement in the winter results in icy conditions.

and important to protect the safety of the traveling public. Should specific trees become unsound before an agency agreement, trees will be removed and appropriate personnel will be notified.

Sight Distance

Standards for calculating sight distances are drawn from AASHTO and the *ADOT Roadway Design Manual*. These documents should be referenced to evaluate sight distance requirements along existing roadways where vegetation has grown in the shoulder area.

Clearing plans should be prepared for any areas requiring vegetation removal and should be reviewed at the Annual Highway Maintenance Partnering Meeting. Potential sight distance problems should be assessed in the field by a multi-agency review team.

Visual impacts of tree removal and pruning should also be considered for any vegetation removed from the ADOT easement and should also be discussed during the Annual Partnering Meeting. Techniques such as feathering the edges of clearing lines and varying the sizes of open spaces can help reduce visual impacts. Refer to Volume 1 and 2 of *National Forest Landscape Management*, Chapter 1, "The Visual Management System."

If pruning or tree removal is necessary, branches should be pruned back to the trunk and tree stumps cut flush to the ground line, ground in place or grubbed. If trees are removed from the ADOT easement, the skid marks and any other disturbed areas may be reseeded at the next appropriate season.

Winter Pavement Shading

Shading of pavement during the winter months may result in icy conditions on highways, Figure 11.4. Winter shading problems should be assessed in the field by a multi-agency review team, and problem areas documented. Impacts of alternatives, including de-icing agents and associated costs, should be evaluated, and a course of action determined. A clearing plan will be prepared for any areas requiring vegetation removal and be reviewed at the Annual Maintenance Partnering Meeting.

As with any removal of vegetation, visual and other environmental considerations should be addressed. Disturbed areas may need to be reseeded.

Brush Removal for Sight Distance

Requirements for brush removal areas for sight distance should correspond to those for tree removal. Brush removal should be considered in areas where significant hazards exist and when adequate resources are available to remove all stumps and reseed if necessary.

Mowing machines should not be used to remove trees and brush. A boom axe operated from the road shoulder is preferable.

Mowing of Shoulders

Mowing, Figure 11.5, may be utilized to control vegetation within recovery areas and other areas that need to remain open for visibility or other considerations. Mowing should be limited to areas where plant stems/trunks are no larger than two inches in diameter.

Figure 11.5 Mowing on shoulders to control vegetation.

Herbicide Use

The *Environmental Assessment for Management of Noxious Weeds and Hazardous Vegetation on Public Roads on National Forest Lands in Arizona* regulates ADOT's herbicide use on FS lands and provides a list of approved herbicides. The associated Memorandum of Understanding provides a strategy for ADOT-FS coordination regarding the presence of invasive plants and hazardous vegetation and planned activities to control and/or remove this vegetation. All ADOT chemical herbicide application activities on roads crossing NF lands are subject to the terms and conditions detailed in the Environmental Assessment (EA) and accompanying MOU (a website link to the EA is listed at the conclusion of this chapter).

Herbicide use on BLM land is limited to those chemicals approved by BLM. ADOT districts should contact the appropriate BLM representative prior to application.

Fertilization and Seeding

Plantings and seed applications should incorporate slow-release fertilizers in order to reduce the transport of nutrients and the need for follow-up fertilization. Should annual field reviews indicate the need for spot applications of fertilizer, they should be coordinated on a case-by-case basis and discussed at the Annual Maintenance Partnering Meeting.

Seed mixes and mulches should be tested and certified to meet the BLM/FS "Weed Free" requirements (refer to Chapter 7). Seed mixes should be composed of species that are indigenous to the project area.

Drainage Structures

Drainage structures should be reviewed during the annual joint field review by both ADOT and BLM/FS. Where structures are not functioning as designed, determine the scope of work required and if immediate action is required.

- If the proposed work is outside the scope of normal maintenance efforts or will impact visual, environmental, and/or cultural resources, include the proposed work in the following Annual Maintenance Partnering Meeting.
- If immediate action is required, repair the facility to its original designed condition.
- When repairing existing drainage structures:
  - Ensure that temporary erosion control measures are taken in order to address concentrated water flows (see Chapter 8).
  - Clearly mark limits of disturbance: maintenance activities should minimize changes to natural stream channel dynamics and minimize removal of native riparian vegetation.
  - Maintenance activities that require disturbing natural stream channels may require a 404 permit from the Corps of Engineers (in addition meeting other regulatory reviews as discussed above).
- If both ADOT and BLM/FS determine that the structure is inadequate and substantial redesign and construction are required, include the proposed work in the following Annual Maintenance Partnering Meeting.

Ditch Cleaning and Shoulder Maintenance Activities

For traffic safety, smooth transitions must be maintained between the edge of the pavement and the adjacent road ditch or shoulder material. This requires occasional build-up or grading of the shoulders and cleaning of ditches below cut slopes, Figure 11.6.

- In order to reduce disturbance to existing vegetation, utilize an appropriately sized front loader.
- If a grader is used, take care to avoid removal of existing vegetation along the shoulder or ditch. If possible, material should only be removed from the ditches and shoulders to the point of existing plant bases.
- The limits of clearing should not exceed the original designed recovery zone.
- Any activities requiring the removal of plant

Figure 11.6 Cleaning of ditches below slopes include cleaning the occasional build-up of rock fall.

cover should be reseeded.
- As described earlier in this chapter, dispose of waste material derived from routine maintenance activities in approved designated areas.
- In areas requiring shoulder build-up, consider using waste materials removed from nearby areas, such as drainages and shoulders. If none is available, haul fill material in from approved material source sites (see Chapter 9).

Cut Slope Maintenance
- Rock Cuts: Rock outcroppings that interfere with sight distance or the turning radii of longer vehicles should be identified and reviewed at the Annual Maintenance Partnering Meeting.
- Soil Cuts: Cuts slopes that are badly eroding may be identified for installation of erosion control devices. If more significant work is required, these slopes may be identified and reviewed at the Annual Maintenance Partnering Meeting.

Unpaved Surfaces
There are a small number of unpaved roads, Figure 11.7, on BLM/FS lands that are maintained by ADOT.
- Maintenance practices for unpaved roads include installation of approved BMP's, grading, dust control and repair or improvement to the drainage structures.
- Environmental documentation may be required for maintenance activities such as surfacing.
- Consider new materials and techniques such as plant-resin-based soil stabilizers in environmentally sensitive locations.
- Paving of unimproved surfaces should be evaluated as a project, taking into consideration the environmental and social benefits.

Fences
Fences are installed along easement lines to control access by vehicles, pedestrians and livestock. ADOT District Maintenance is typically responsible for the maintenance of all easement fences. When damaged by BLM/FS activities such as logging, fuel wood sales or controlled burns, BLM or FS should repair easement fences to the original or better condition.

Walls
Where maintenance is required, disturbances to adjacent slopes should be minimized. Maintenance vehicle access should be carefully reviewed prior to onset of work. Waste materials should be hauled to designated waste disposal areas. Disturbed areas should be reviewed for re-seeding.

Bridges
As discussed in Chapter 5, access for bridge maintenance should be considered during the design process. In order to minimize disturbances to riparian environments, consider performing bridge maintenance from the bridge deck utilizing mechanical lifts. If work in the stream channel is required, clearly mark limits of disturbance: maintenance activities should minimize changes to natural stream channel dynamics and minimize removal of native riparian vegetation.

Roadside Barriers
When required, non-standard roadside barriers (such as non-speculor steel, Figure 11.8) will be replaced with similar materials. The ADOT district will stockpile non-standard barriers for that purpose. If agreed to at the Annual Maintenance Partnering

Figure 11.7 Maintenence of unpaved roads include installation of approved BMP's.

Figure 11.8 Non-speculor steel roadside barrier.

Meeting and if the district exhausts its inventory of non-standard barriers, any damaged barrier will be repaired with the current standard barrier. This standard barrier may be scheduled for replacement by non-standard barrier.

Winter Storm Management Program
It is ADOT's responsibility to keep roads safe and operational during adverse winter weather. ADOT employs various techniques to control snow and ice including snow removal, application of anti-icing/de-icing and abrasive materials, reduction of shade over travelways and installation of snow fences. Techniques used and amount of material applied vary with storm intensity, season, location, temperatures, etc.

Under the current MOU and as a part of the Annual Maintenance Partnering Meeting, ADOT should supply BLM/FS with annual winter storm management plans that include proposed activities and materials.

Snow Removal
Snow removal operations and route priorities are identified in district-specific snow plans. When blading snow to the side of the travelway, ensure that cinders and other inert materials that are also plowed to do not interfere with drainage structures as the snow melts, Figure 11.9.

Figure 11.9 Snow removal should ensure inert materials do not interfere with drainage structure as the snow melts.

Application of Anti-icing/De-icing and Abrasive Materials
The application of anti-icing/de-icing and abrasive materials may occur prior to, during, and/or after a storm event to prevent ice from bonding to pavement or provide additional traction to snow-covered surfaces. ADOT has a general statewide schedule for application of anti-icing, de-icing, and abrasive materials. This schedule provides recommendations for types of materials to be applied based on local soil regimes, water quality and other related factors. Those materials utilized most frequently by ADOT include sodium chloride, magnesium chloride, calcium chloride, calcium magnesium acetate, cinders and sand. Ethylglycol may NOT be used within FS boundaries.

Shade Reduction
Flattening of slopes and removal of trees and other shade producing structures are long-term options to reduce maintenence expense and improve inclement weather driving conditions.

Snowdrift Control
Since snowdrifting is typically a problem in open areas, aesthetics should be considered when selecting the necessary control measures. Properly located native vegetation, Figure 11.10, and/or snow fences can both serve as windbreaks. Color and materials should be reviewed for manmade windbreaks, which should be removed during the off-season.

Figure 11.10 Properly located native vegetation can serve as windbreaks.

11.5 EMERGENCY PROCEDURES

Emergency Notification
Each ADOT District Maintenance Supervisor should maintain a BLM/FS emergency contact listing for notification in the event of emergency events. BLM/FS should maintain ADOT emergency contact listing

for notification in the event of emergency events. Coordination of activities and repairs should be discussed and agreed upon to restore the system to the original state as soon as possible.

Emergency Maintenance Procedures
Maintenance procedures that are required as a result of emergencies or natural disasters generally need to begin immediately after the incident. In order to maintain traffic, protect resources or populations, operations are often implemented in the field without extensive plans or documentation. Emergency relief funding can be offered to agencies to repair facilities. Projects implemented under these circumstances are categorically excluded under NEPA.

Repairs should be prioritized according to a predetermined set of criteria, such as the repair of major structures on the main route, repair of a structures on secondary routes, repair of a drainage systems, revegetation work, etc.

As directed in Federal-Aid Emergency Relief Program, emergency repairs and maintenance operations should focus on restoring features to the state they were in prior to the incident with the least impacts to the area. Features that were not existent prior to the incident should not be added immediately after an incident with emergency funds. For instance, an undersized culvert should not be upgraded to a bridge following the incident. However, the Emergency Relief Program does allow a reasonable level of betterment to make the roadway less susceptible to damage in the future. Therefore, for the example cited above, while a bridge should not replace a damaged pipe (a total change of function), a larger pipe might be an appropriate consideration in making the repairs.

11.6 BLM/FOREST SERVICE MAINTENANCE OPERATION ACTIVITIES

BLM/FS activities requiring coordination with ADOT District Highway Traffic Division and ADOT District Maintenance Operations include the following and should be reviewed at the Annual Maintenance Partnering Meeting:

- Slash burning and other controlled burns (including back-burning for fire breaks).
- Care must be taken to avoid damage to highway structures such as guardrail, fence and fence supports and signs.
- Logging across highways.
- Temporary road access to highways.
- Maintenance of minor roads intersecting with highways.

Minor BLM/FS roads provide access to recreational areas, private property, and businesses. Where the vertical alignment of an unpaved minor road slopes toward the highway, stormwater runoff can damage highway earthwork and carry sediment and debris onto the road surface, creating a potential driving hazard. Vehicles entering the highway may track unacceptable quantities of mud and debris onto the highway. Therefore, BLM/FS need to maintain the approaches of these minor roads. Consider surfacing the road with sufficient aggregate to dislodge the mud and debris from wheels before the vehicles enter the highway.

11.7 ADDITIONAL INFORMATION

ADOT Stormwater Program website (including link to Maintenance and Facilities Best Management Practices Manual):
http://www.azdot.gov/adot_and/storm_water/PDF/maintenence_and_facilities_bmp_manual.pdf

State Noxious Weed List:
http://www.azda.gov/PSD/quarantine5.htm

Federal Noxious Weed List: **http://plants.usda.gov/java/noxious?rptType=Federal**

Environmental Assessment for Management of Noxious Weds and Hazardous Vegetation on Public Roads on National Forest System Lands in Arizona:
http://www.fs.fed.us/r3/projects/ro/ea-noxiousweeds/ea-noxious-weeds.pdf

Forest Service Pesticide Use Proposal Form (FS 2100-2):
http://www.fs.fed.us/r3/coronado/forest/projects/environ/EAs/eas/invasive_plant_ea/appendix-b.pdf

Report 341, Integrated Roadside Vegetation Management, National Cooperative Highway Research Program:
http://gulliver.trb.org/publications/nchrp/nchrp_syn_341.pdf

Arizona Invasive Plant Working Group: *Invasive Non-Native Plants That Threaten Wildlands in Arizona*